



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 02:01 PM UTC

PDB ID : 6G46 / pdb_00006g46
Title : Red kidney bean purple acid phosphatase in complex with 2-(Naphthalen-1-yl)thiazole-4-carboxylic acid
Authors : Feder, D.F.
Deposited on : 2018-03-26
Resolution : 2.40 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

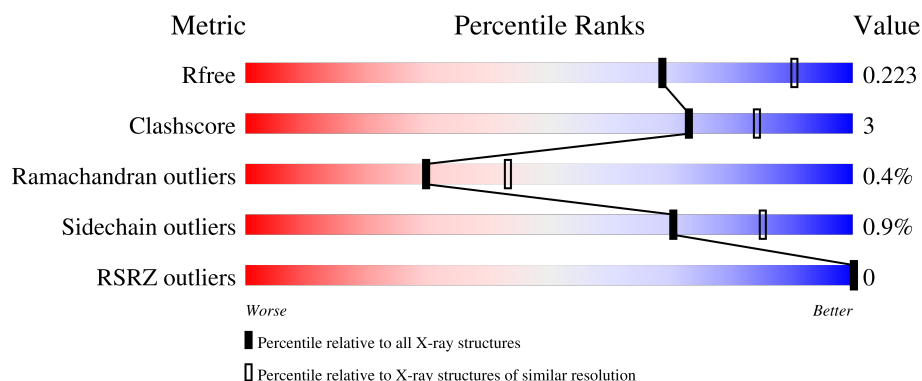
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

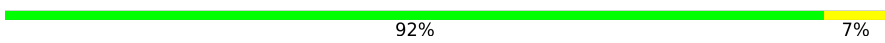
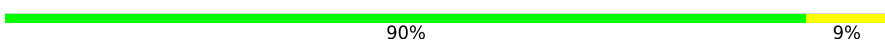
The reported resolution of this entry is 2.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



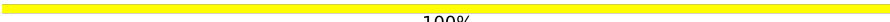
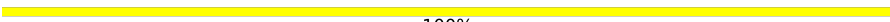
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	426	
1	B	426	
1	C	426	
1	D	426	
2	E	3	

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Mol	Chain	Length	Quality of chain
2	F	3	 100%
2	G	3	 100%
2	I	3	 67% 33%
2	J	3	 67% 33%
2	M	3	 100%
3	H	2	 100%
3	K	2	 50% 50%
3	L	2	 50% 50%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	SO4	D	512	-	-	X	-

2 Entry composition [i](#)

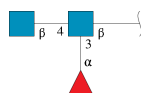
There are 13 unique types of molecules in this entry. The entry contains 15764 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Fe(3+)-Zn(2+) purple acid phosphatase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	424	Total	C	N	O	S	0	1	0
			3502	2248	610	634	10			
1	B	425	Total	C	N	O	S	9	3	0
			3524	2260	612	641	11			
1	D	423	Total	C	N	O	S	0	1	0
			3493	2245	606	632	10			
1	C	424	Total	C	N	O	S	0	0	0
			3497	2246	608	633	10			

- Molecule 2 is an oligosaccharide called alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	3	Total	C	N	O	0	0	0
			38	22	2	14			
2	F	3	Total	C	N	O	0	0	0
			38	22	2	14			
2	G	3	Total	C	N	O	0	0	0
			38	22	2	14			
2	I	3	Total	C	N	O	0	0	0
			38	22	2	14			
2	J	3	Total	C	N	O	0	0	0
			38	22	2	14			
2	M	3	Total	C	N	O	0	0	0
			38	22	2	14			

- Molecule 3 is an oligosaccharide called alpha-L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	H	2	Total	C	N	O	0	0	0
			24	14	1	9			
3	K	2	Total	C	N	O	0	0	0
			24	14	1	9			
3	L	2	Total	C	N	O	0	0	0
			24	14	1	9			

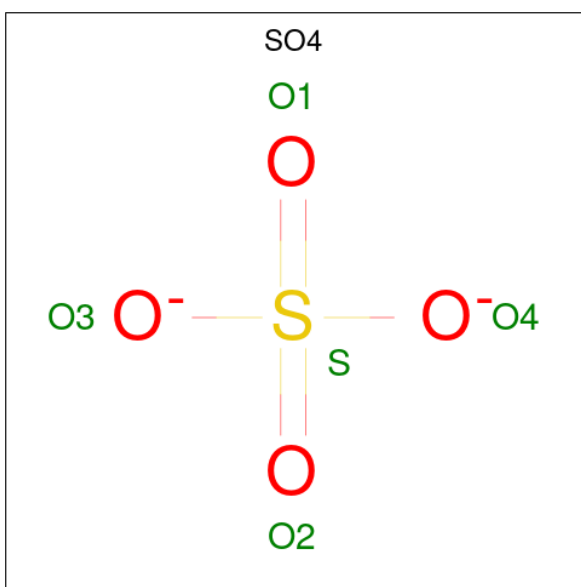
- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		
4	B	1	Total	Zn	0	0
			1	1		
4	D	1	Total	Zn	0	0
			1	1		
4	C	1	Total	Zn	0	0
			1	1		

- Molecule 5 is FE (III) ION (CCD ID: FE) (formula: Fe).

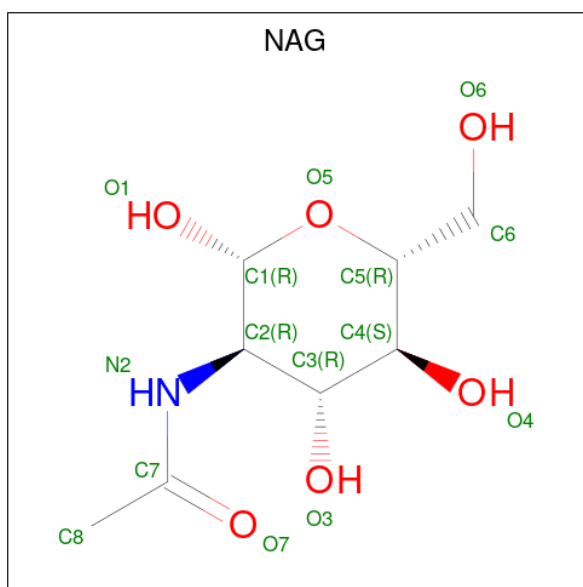
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Fe	0	0
			1	1		
5	B	1	Total	Fe	0	0
			1	1		
5	D	1	Total	Fe	0	0
			1	1		
5	C	1	Total	Fe	0	0
			1	1		

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



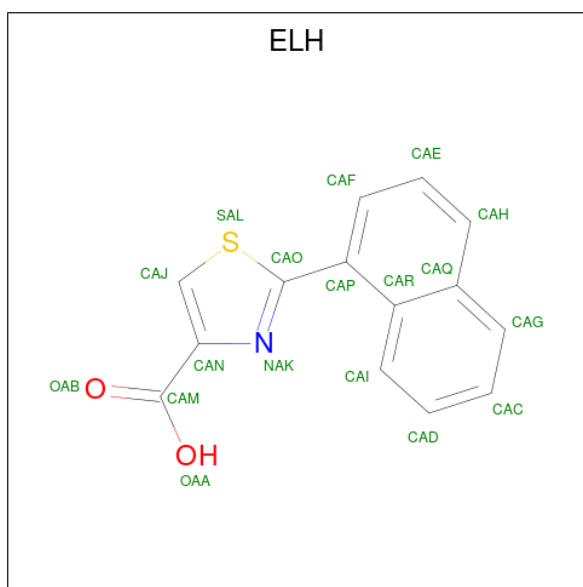
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	D	1	Total	O	S	0	0
			5	4	1		
6	D	1	Total	O	S	0	0
			5	4	1		
6	C	1	Total	O	S	0	0
			5	4	1		
6	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



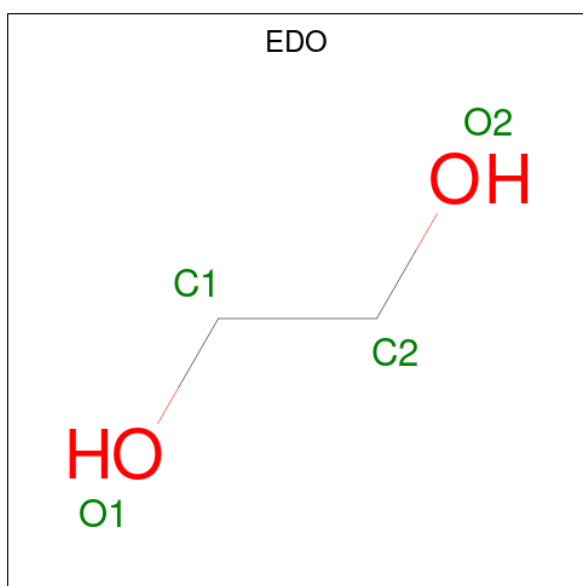
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			14	8	1	5		
7	B	1	Total	C	N	O	0	0
			14	8	1	5		
7	B	1	Total	C	N	O	0	0
			14	8	1	5		
7	D	1	Total	C	N	O	0	0
			14	8	1	5		
7	D	1	Total	C	N	O	0	0
			14	8	1	5		
7	C	1	Total	C	N	O	0	0
			14	8	1	5		
7	C	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 8 is 2-naphthalen-1-yl-1,3-thiazole-4-carboxylic acid (CCD ID: ELH) (formula: $C_{14}H_9NO_2S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	A	1	Total	C	N	O	S	0	0
			18	14	1	2	1		
8	B	1	Total	C	N	O	S	0	0
			18	14	1	2	1		

- Molecule 9 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			4	2	2		
9	B	1	Total	C	O	0	0
			4	2	2		

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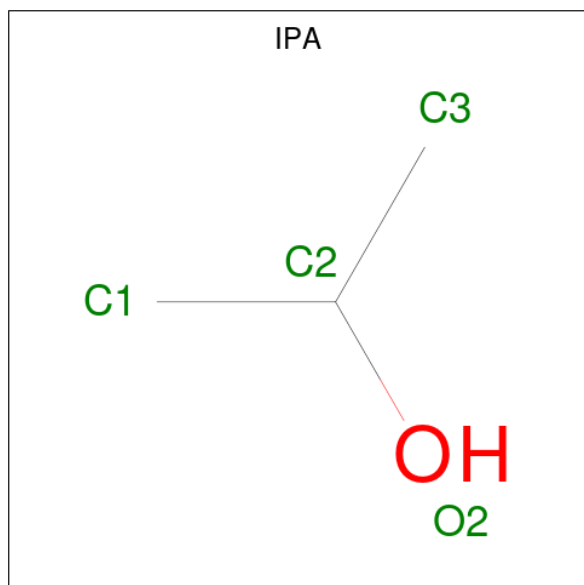
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	B	1	Total	C	O	0	0
			4	2	2		
9	B	1	Total	C	O	0	0
			4	2	2		
9	D	1	Total	C	O	0	0
			4	2	2		
9	D	1	Total	C	O	0	0
			4	2	2		
9	C	1	Total	C	O	0	0
			4	2	2		

- Molecule 10 is SODIUM ION (CCD ID: NA) (formula: Na).

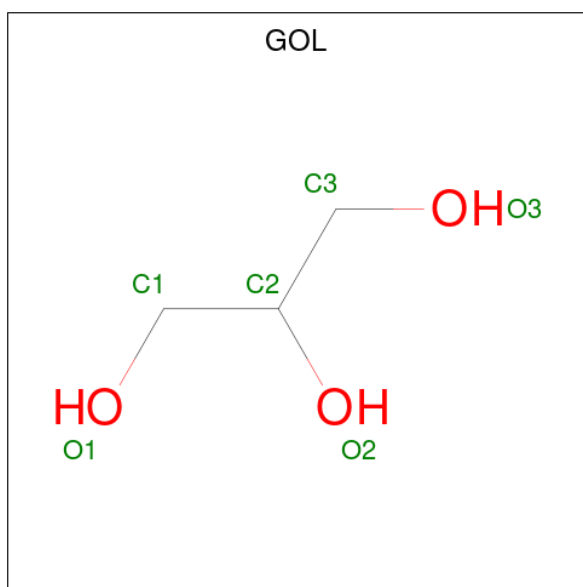
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	B	2	Total	Na	0	0
			2	2		
10	D	1	Total	Na	0	0
			1	1		

- Molecule 11 is ISOPROPYL ALCOHOL (CCD ID: IPA) (formula: C₃H₈O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	B	1	Total	C	O	0	0
			4	3	1		

- Molecule 12 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
12	C	1	Total	C	O	0	0
			6	3	3		

- Molecule 13 is water.

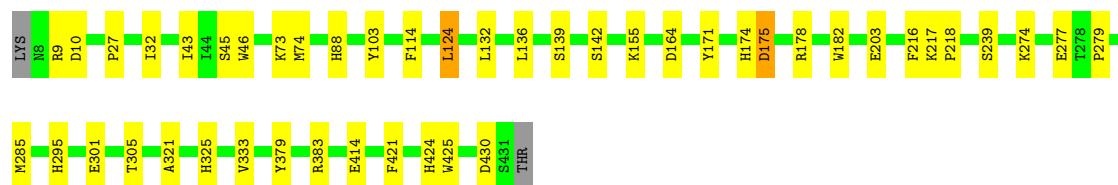
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	332	Total	O	0	0
			332	332		
13	B	283	Total	O	0	0
			283	283		
13	D	319	Total	O	0	0
			319	319		
13	C	291	Total	O	0	0
			291	291		

3 Residue-property plots

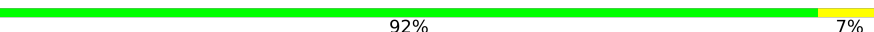
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

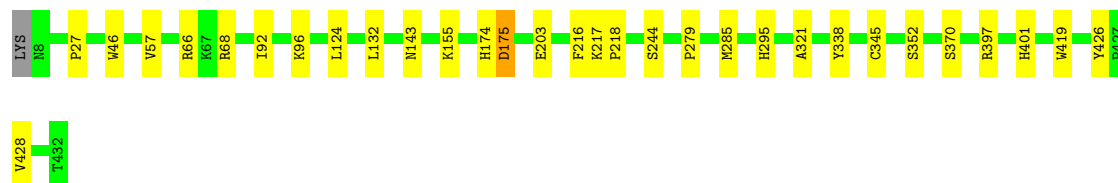
- Molecule 1: Fe(3+)-Zn(2+) purple acid phosphatase

Chain A: 

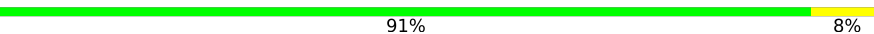


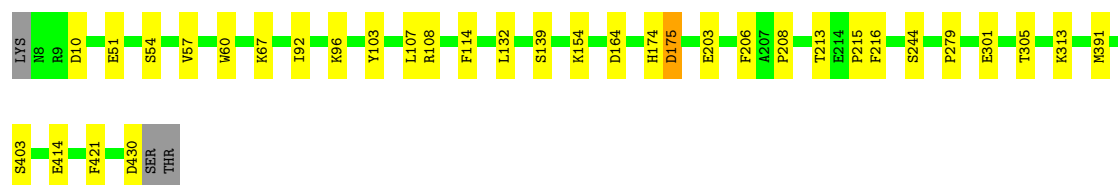
- Molecule 1: Fe(3+)-Zn(2+) purple acid phosphatase

Chain B: 



- Molecule 1: Fe(3+)-Zn(2+) purple acid phosphatase

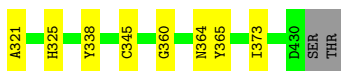
Chain D: 



- Molecule 1: Fe(3+)-Zn(2+) purple acid phosphatase

Chain C: 





- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E: 67% 33%



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F: 100%



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain G: 100%



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I: 67% 33%



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain J: 67% 33%



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain M: 100%



- Molecule 3: alpha-L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:  100%

NAG1
FUC2

- Molecule 3: α -L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain K:  50%  50%

NAG1
FUC2

- Molecule 3: α -L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain L:  50%  50%

NAG1
FUC2

4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	126.21Å 126.21Å 297.12Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.26 – 2.40 43.26 – 2.40	Depositor EDS
% Data completeness (in resolution range)	98.8 (43.26-2.40) 98.8 (43.26-2.40)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.99 (at 2.39Å)	Xtriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, R_{free}	0.172 , 0.223 0.173 , 0.223	Depositor DCC
R_{free} test set	5324 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	33.9	Xtriage
Anisotropy	0.032	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 25.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.146 for -h,-k,l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	15764	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.60% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, ELH, IPA, FE, NAG, NA, FUC, ZN, SO4, EDO

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.37	0/3624	0.54	0/4927
1	B	0.36	0/3643	0.54	0/4953
1	C	0.38	0/3616	0.56	2/4916 (0.0%)
1	D	0.37	0/3615	0.54	0/4916
All	All	0.37	0/14498	0.55	2/19712 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	132	LEU	CA-CB-CG	-5.11	98.43	116.30
1	C	66	ARG	N-CA-C	-5.04	102.40	109.96

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3502	0	3321	24	0
1	B	3524	0	3334	20	0
1	C	3497	0	3316	25	0
1	D	3493	0	3314	17	0
2	E	38	0	34	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	38	0	34	0	0
2	G	38	0	34	0	0
2	I	38	0	34	0	0
2	J	38	0	34	0	0
2	M	38	0	34	0	0
3	H	24	0	22	0	0
3	K	24	0	22	1	0
3	L	24	0	22	1	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	A	10	0	0	0	0
6	B	10	0	0	0	0
6	C	10	0	0	1	0
6	D	10	0	0	2	0
7	A	14	0	13	0	0
7	B	28	0	26	1	0
7	C	28	0	26	0	0
7	D	28	0	26	0	0
8	A	18	0	0	4	0
8	B	18	0	0	3	0
9	A	4	0	6	0	0
9	B	12	0	18	1	0
9	C	4	0	6	1	0
9	D	8	0	12	2	0
10	B	2	0	0	0	0
10	D	1	0	0	0	0
11	B	4	0	8	0	0
12	C	6	0	8	0	0
13	A	332	0	0	2	0
13	B	283	0	0	1	0
13	C	291	0	0	1	0
13	D	319	0	0	1	0
All	All	15764	0	13704	89	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

The worst 5 of 89 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:258:ARG:N	6:C:511:SO4:O2	2.19	0.76
1:B:143:ASN:HD22	7:B:507:NAG:H83	1.54	0.72
1:B:244:SER:HB2	1:B:279:PRO:HD2	1.79	0.65
1:C:169:ASP:OD2	13:C:601:HOH:O	2.14	0.64
1:B:124:LEU:HD12	1:B:279:PRO:HG3	1.83	0.60

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	423/426 (99%)	402 (95%)	18 (4%)	3 (1%)	18	28
1	B	426/426 (100%)	404 (95%)	21 (5%)	1 (0%)	43	58
1	C	422/426 (99%)	400 (95%)	21 (5%)	1 (0%)	43	58
1	D	422/426 (99%)	403 (96%)	17 (4%)	2 (0%)	24	37
All	All	1693/1704 (99%)	1609 (95%)	77 (4%)	7 (0%)	30	43

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	175	ASP
1	B	175	ASP
1	D	175	ASP
1	C	175	ASP
1	A	164	ASP

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	374/375 (100%)	369 (99%)	5 (1%)	61	80
1	B	377/375 (100%)	374 (99%)	3 (1%)	73	86
1	C	373/375 (100%)	370 (99%)	3 (1%)	73	86
1	D	373/375 (100%)	370 (99%)	3 (1%)	73	86
All	All	1497/1500 (100%)	1483 (99%)	14 (1%)	70	85

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	370	SER
1	D	107	LEU
1	C	373	ILE
1	C	132	LEU
1	C	211	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	64	ASN
1	C	173	ASN
1	C	294	ASN
1	C	176	ASN
1	B	176	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

24 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	E	1	1,2	14,14,15	0.61	0	17,19,21	0.53	0
2	FUC	E	2	2	10,10,11	1.17	1 (10%)	14,14,16	1.18	2 (14%)
2	NAG	E	3	2	14,14,15	0.40	0	17,19,21	0.51	0
2	NAG	F	1	1,2	14,14,15	0.57	0	17,19,21	0.73	1 (5%)
2	FUC	F	2	2	10,10,11	0.79	0	14,14,16	1.12	2 (14%)
2	NAG	F	3	2	14,14,15	0.59	0	17,19,21	0.66	1 (5%)
2	NAG	G	1	1,2	14,14,15	0.53	0	17,19,21	0.72	1 (5%)
2	FUC	G	2	2	10,10,11	1.06	0	14,14,16	0.99	1 (7%)
2	NAG	G	3	2	14,14,15	0.73	1 (7%)	17,19,21	0.73	1 (5%)
3	NAG	H	1	1,3	14,14,15	0.70	0	17,19,21	0.85	1 (5%)
3	FUC	H	2	3	10,10,11	0.93	0	14,14,16	0.92	1 (7%)
2	NAG	I	1	1,2	14,14,15	0.58	0	17,19,21	0.70	0
2	FUC	I	2	2	10,10,11	0.95	1 (10%)	14,14,16	0.93	0
2	NAG	I	3	2	14,14,15	0.48	0	17,19,21	0.64	0
2	NAG	J	1	1,2	14,14,15	0.50	0	17,19,21	0.52	0
2	FUC	J	2	2	10,10,11	1.10	1 (10%)	14,14,16	1.14	1 (7%)
2	NAG	J	3	2	14,14,15	0.36	0	17,19,21	0.51	0
3	NAG	K	1	1,3	14,14,15	0.51	0	17,19,21	0.73	0
3	FUC	K	2	3	10,10,11	1.34	2 (20%)	14,14,16	0.87	0
3	NAG	L	1	1,3	14,14,15	0.49	0	17,19,21	0.74	0
3	FUC	L	2	3	10,10,11	0.89	0	14,14,16	0.75	0
2	NAG	M	1	1,2	14,14,15	0.61	0	17,19,21	0.49	0
2	FUC	M	2	2	10,10,11	0.88	0	14,14,16	0.77	0
2	NAG	M	3	2	14,14,15	0.46	0	17,19,21	0.41	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	E	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	E	2	2	-	-	0/1/1/1
2	NAG	E	3	2	-	2/6/23/26	0/1/1/1
2	NAG	F	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	F	2	2	-	-	0/1/1/1
2	NAG	F	3	2	-	4/6/23/26	0/1/1/1
2	NAG	G	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	G	2	2	-	-	0/1/1/1
2	NAG	G	3	2	-	0/6/23/26	0/1/1/1
3	NAG	H	1	1,3	-	2/6/23/26	0/1/1/1
3	FUC	H	2	3	-	-	0/1/1/1
2	NAG	I	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	I	2	2	-	-	0/1/1/1
2	NAG	I	3	2	-	1/6/23/26	0/1/1/1
2	NAG	J	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	J	2	2	-	-	0/1/1/1
2	NAG	J	3	2	-	2/6/23/26	0/1/1/1
3	NAG	K	1	1,3	-	0/6/23/26	0/1/1/1
3	FUC	K	2	3	-	-	0/1/1/1
3	NAG	L	1	1,3	-	0/6/23/26	0/1/1/1
3	FUC	L	2	3	-	-	0/1/1/1
2	NAG	M	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	M	2	2	-	-	0/1/1/1
2	NAG	M	3	2	-	2/6/23/26	0/1/1/1

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	K	2	FUC	O5-C5	2.41	1.48	1.43
2	I	2	FUC	O5-C5	2.28	1.48	1.43
2	J	2	FUC	C2-C3	2.28	1.56	1.52
2	E	2	FUC	O5-C5	2.20	1.47	1.43
2	G	3	NAG	O5-C1	-2.14	1.40	1.43

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	H	1	NAG	C1-O5-C5	2.98	116.17	112.19
2	J	2	FUC	C1-O5-C5	2.95	119.94	112.97
2	E	2	FUC	O5-C5-C4	2.36	113.80	109.55
2	E	2	FUC	O2-C2-C1	2.34	114.59	109.22
2	G	1	NAG	C1-O5-C5	2.34	115.32	112.19

There are no chirality outliers.

5 of 13 torsion outliers are listed below:

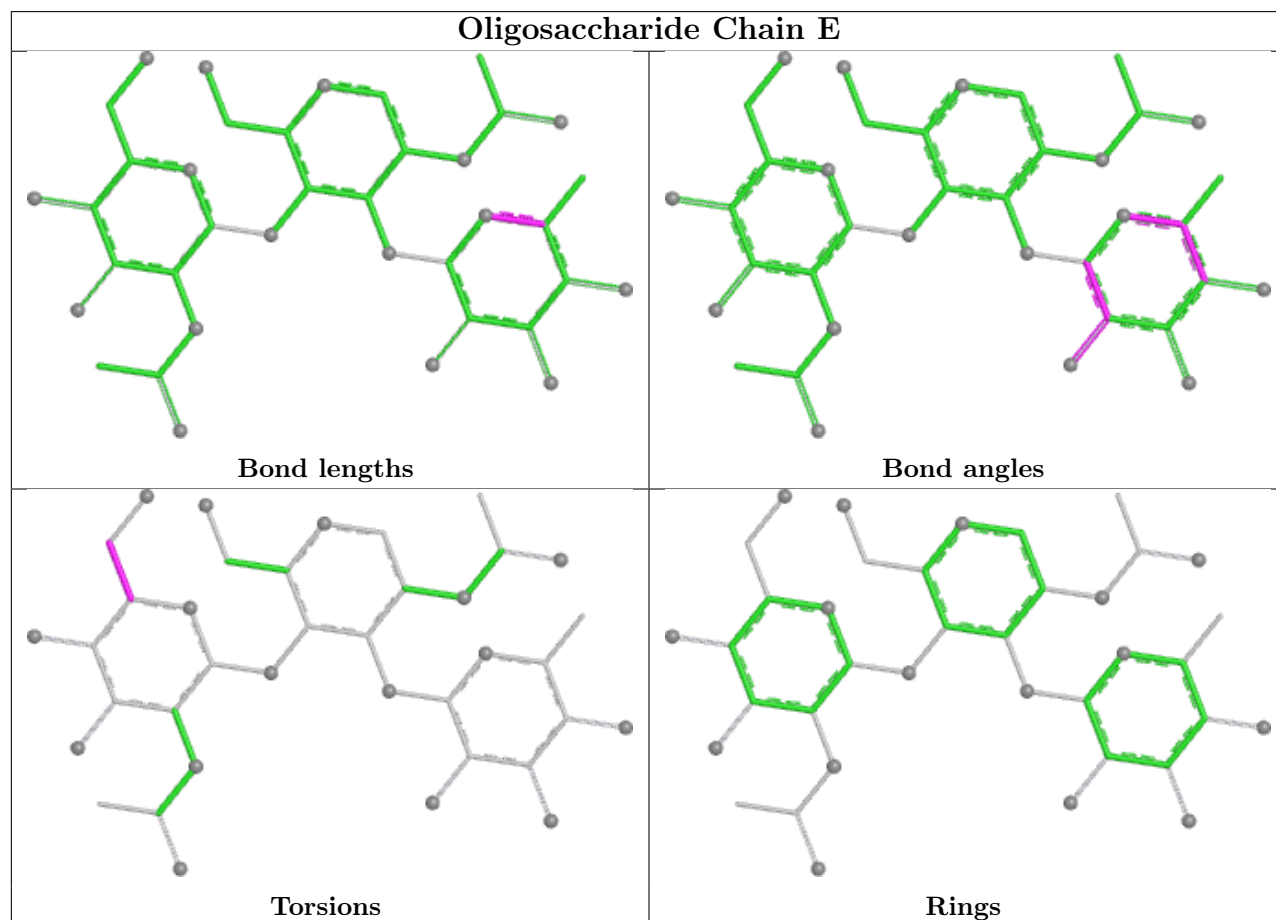
Mol	Chain	Res	Type	Atoms
2	J	3	NAG	O5-C5-C6-O6
2	F	3	NAG	O5-C5-C6-O6
2	J	3	NAG	C4-C5-C6-O6
2	E	3	NAG	C4-C5-C6-O6
2	M	3	NAG	C4-C5-C6-O6

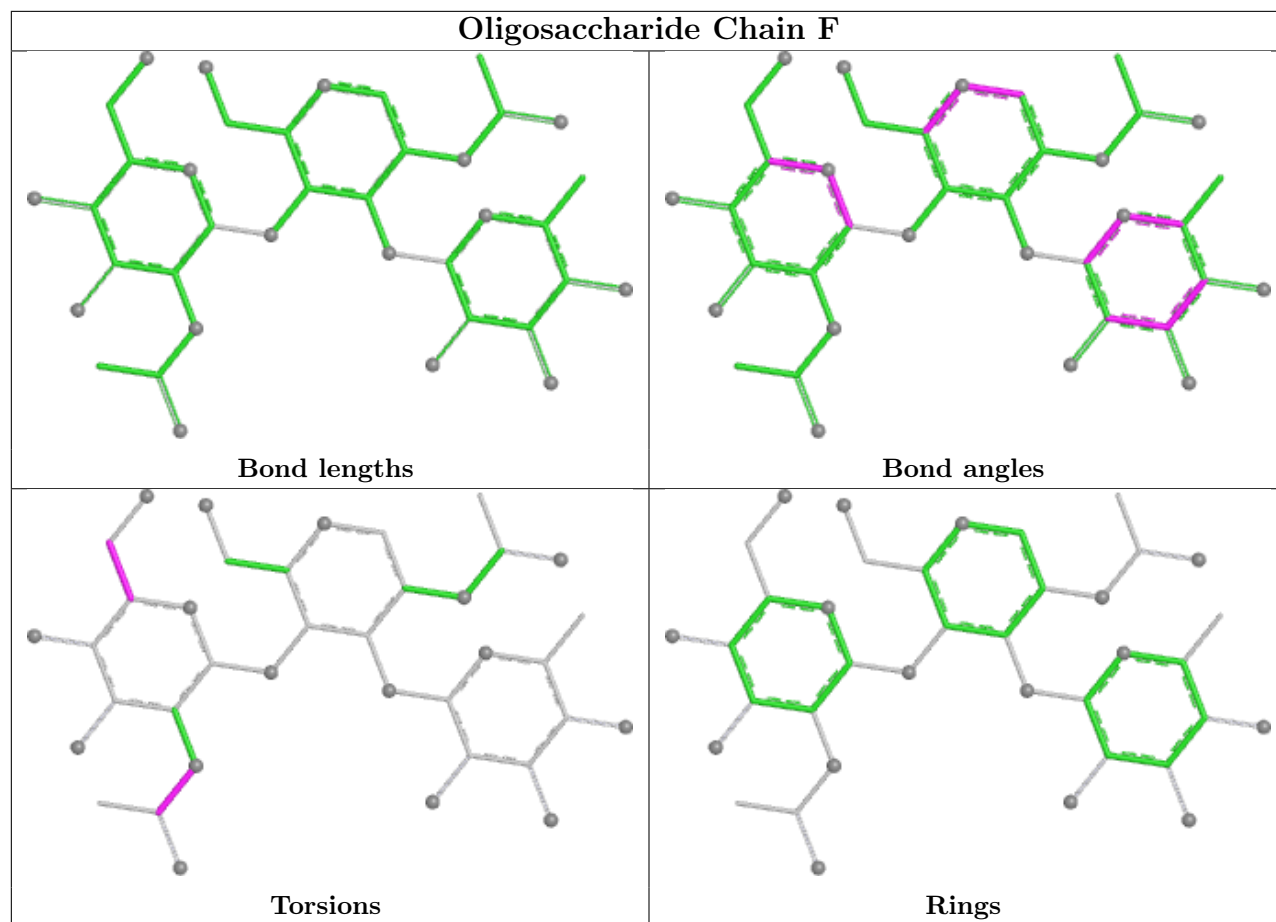
There are no ring outliers.

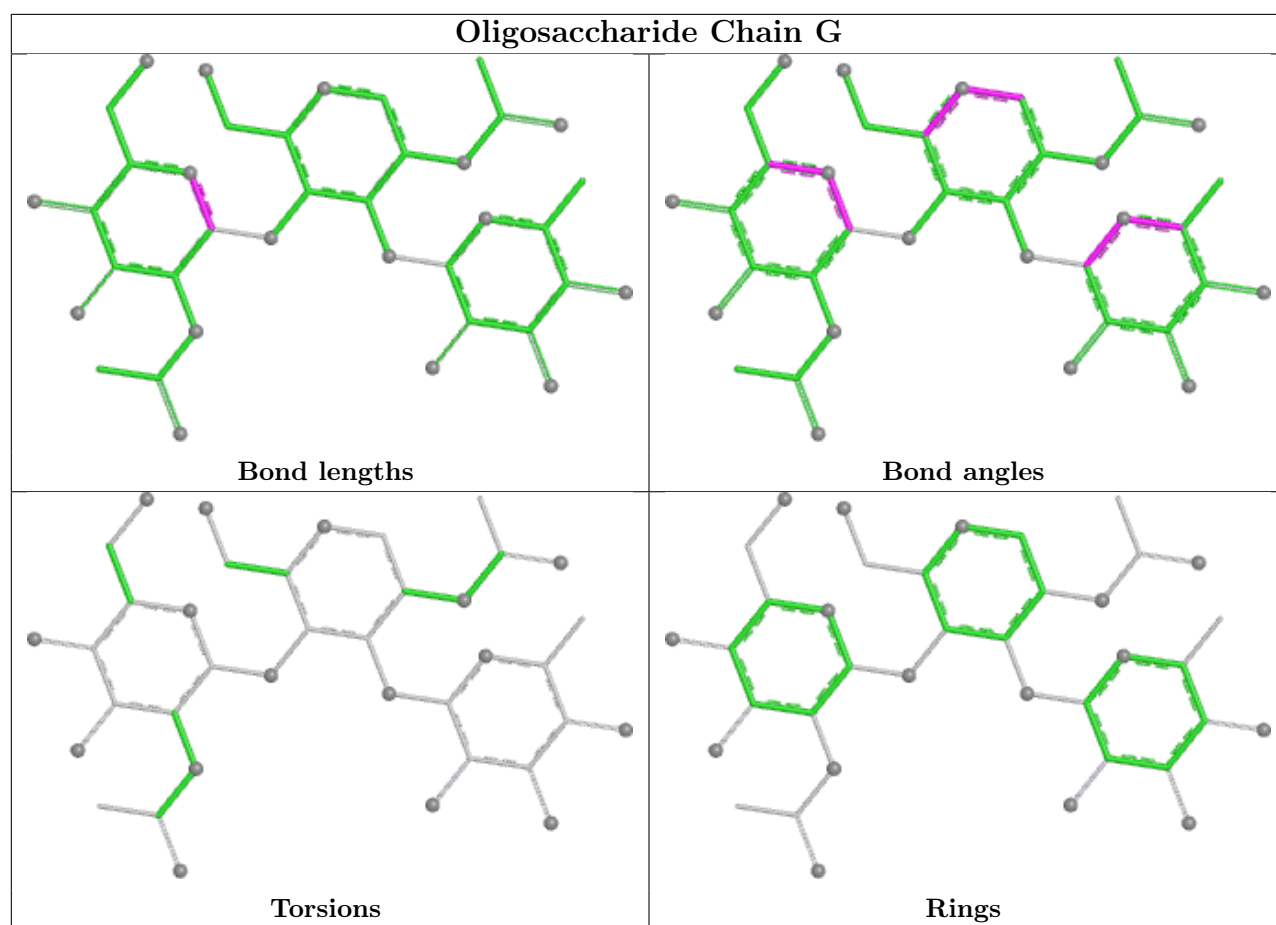
3 monomers are involved in 2 short contacts:

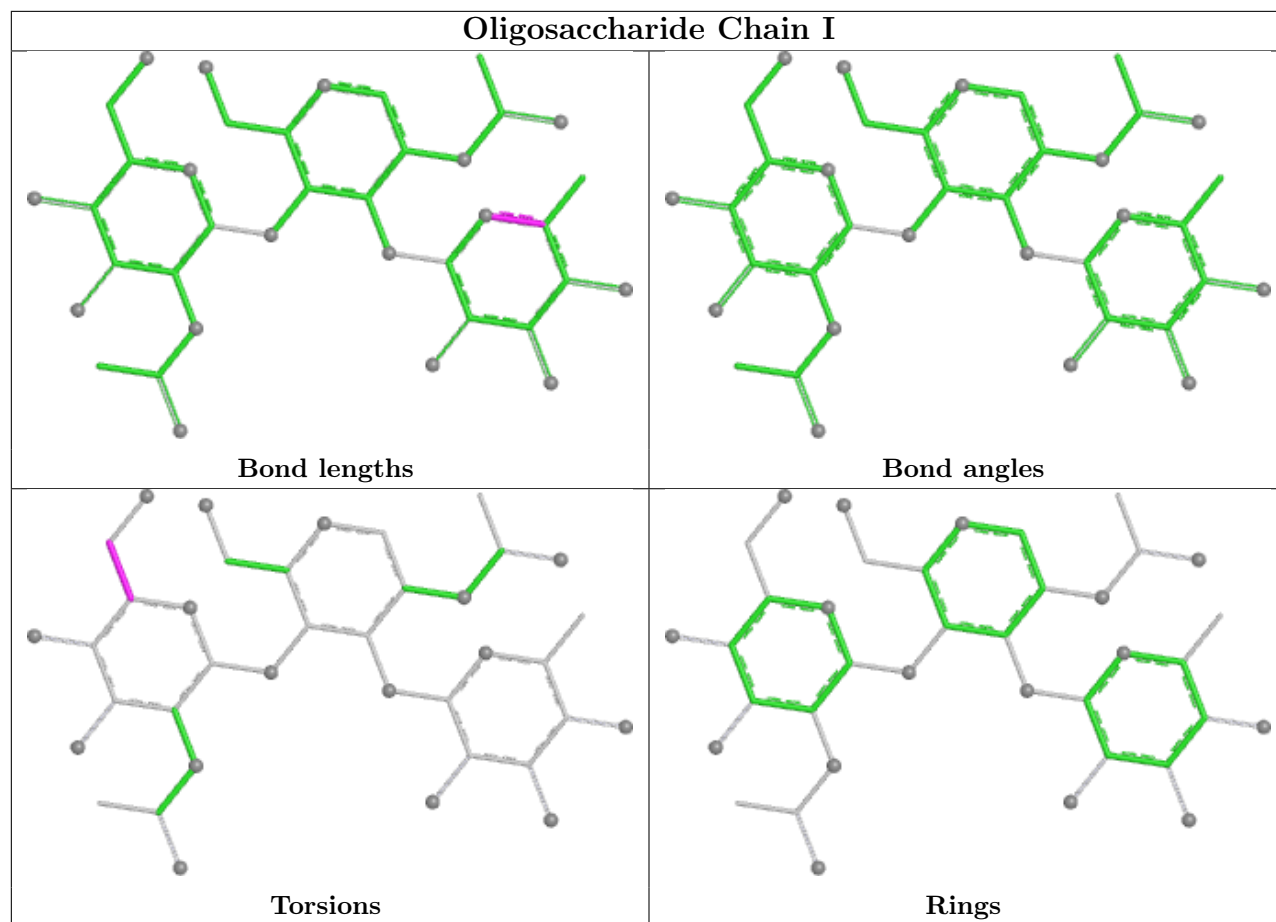
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	L	1	NAG	1	0
3	K	2	FUC	1	0
3	K	1	NAG	1	0

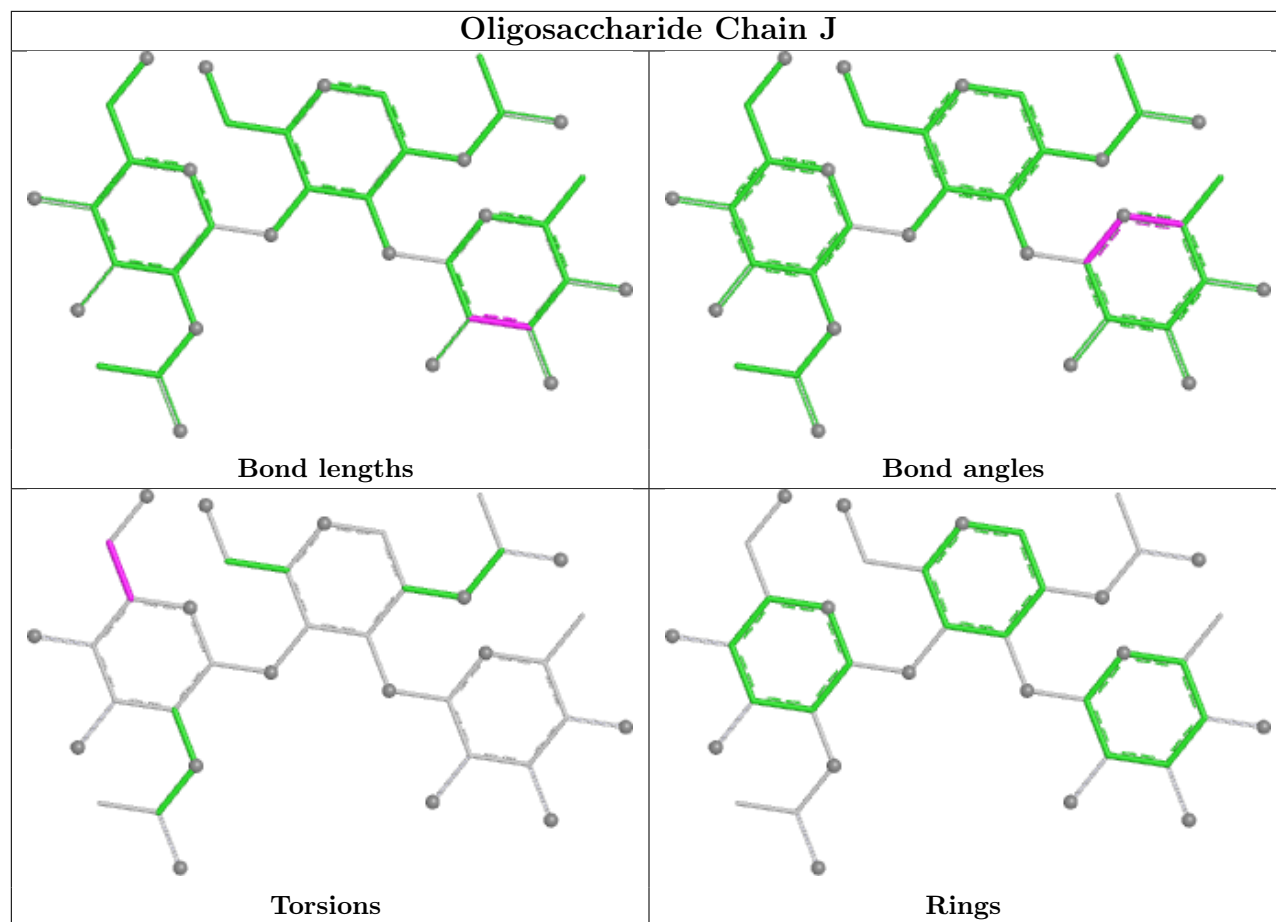
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

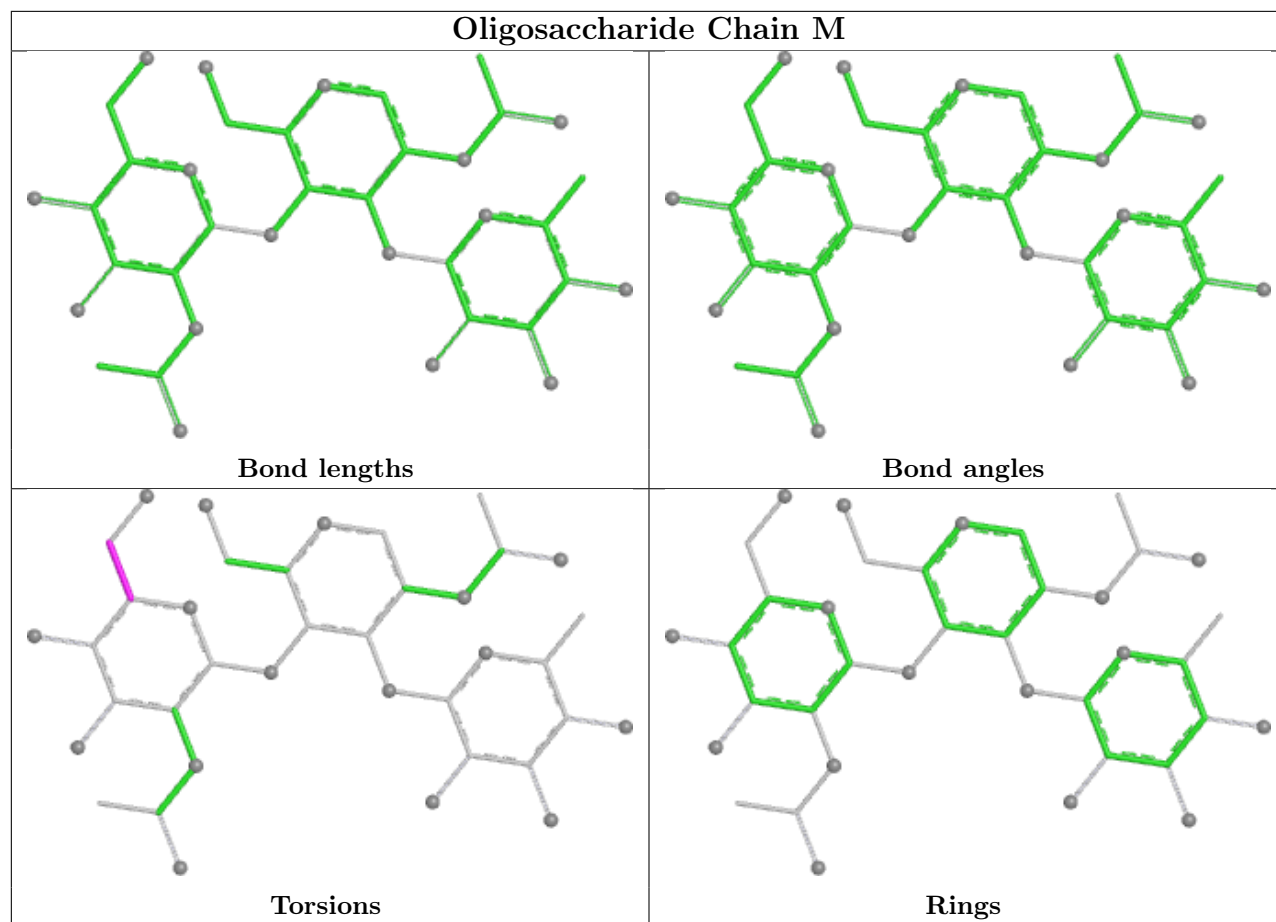




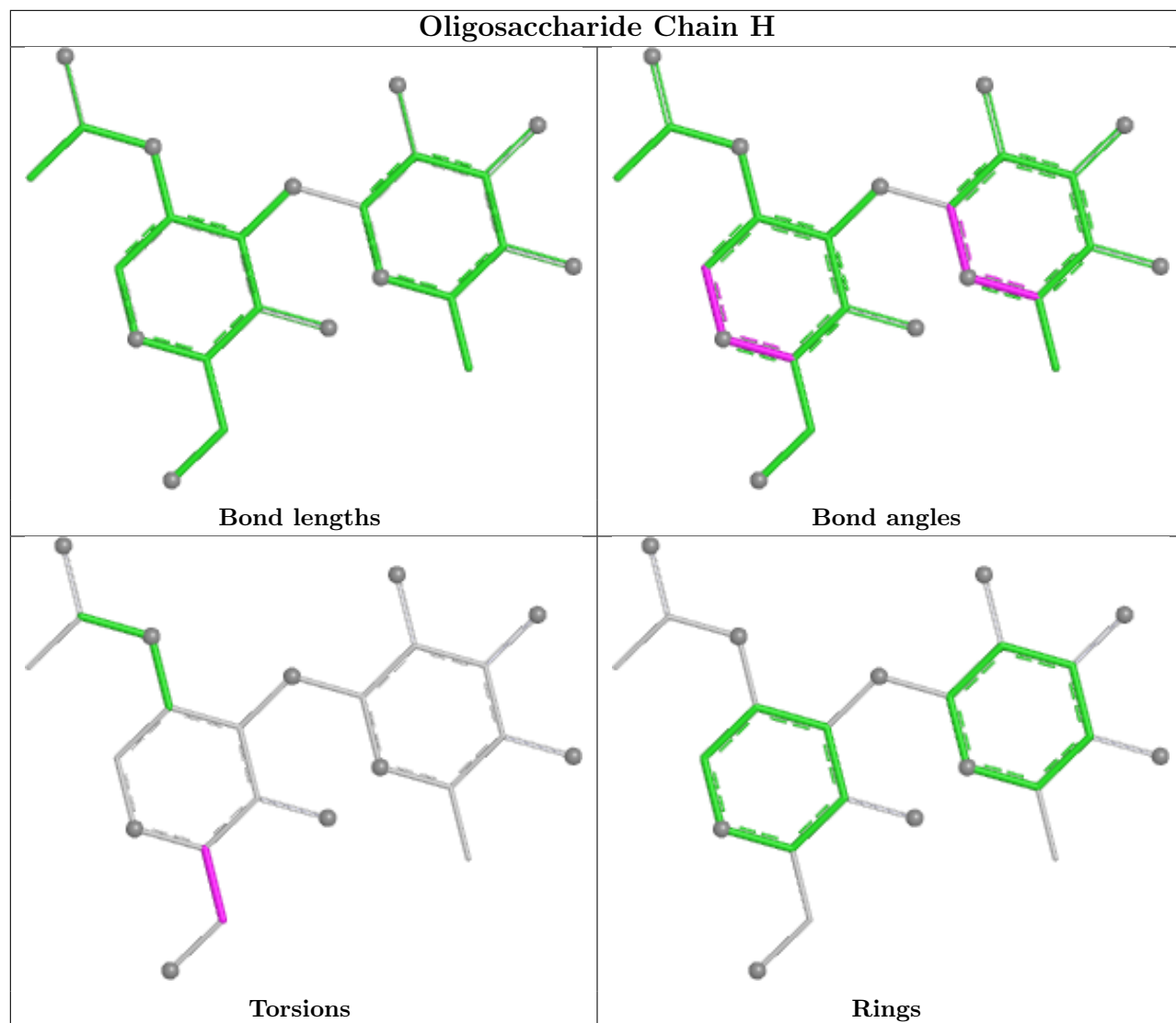




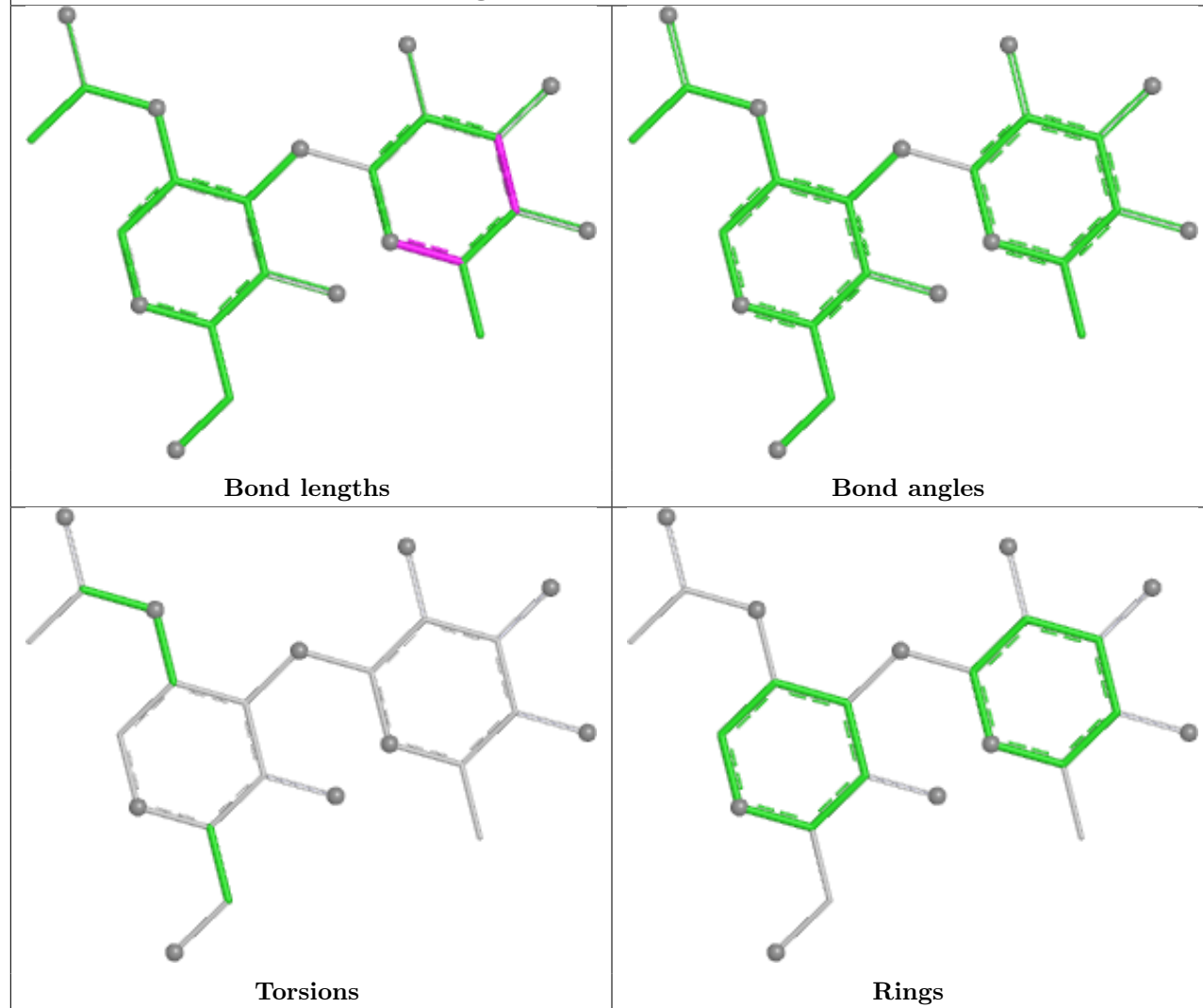


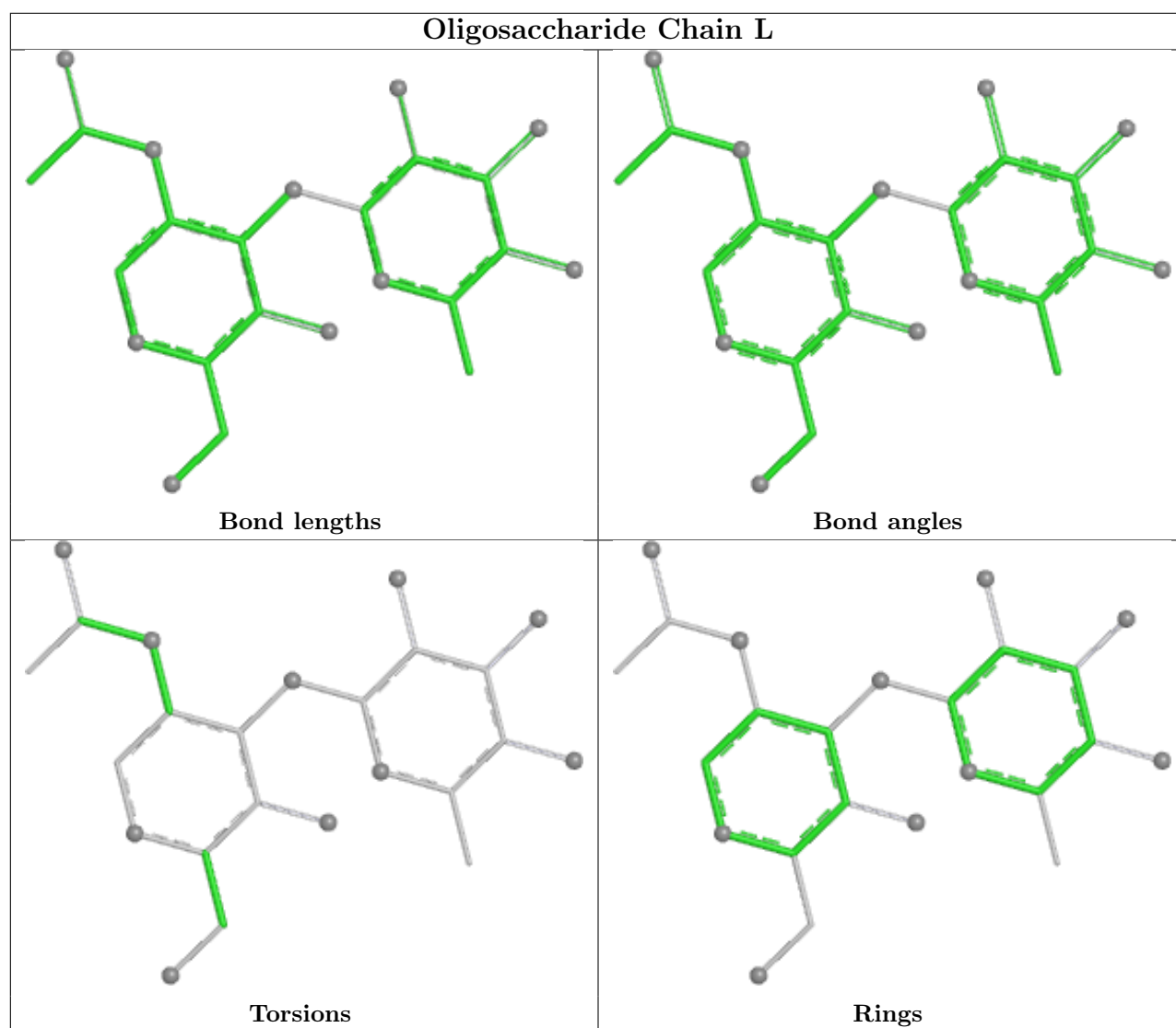


Oligosaccharide Chain H



Oligosaccharide Chain K





5.6 Ligand geometry [i](#)

Of 37 ligands modelled in this entry, 11 are monoatomic - leaving 26 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
7	NAG	B	507	1	14,14,15	0.52	0	17,19,21	0.63	0
9	EDO	C	512	-	3,3,3	0.48	0	2,2,2	0.38	0
6	SO4	A	504	-	4,4,4	0.29	0	6,6,6	0.23	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	NAG	C	505	1	14,14,15	0.63	0	17,19,21	0.81	1 (5%)
7	NAG	B	506	1	14,14,15	1.01	2 (14%)	17,19,21	0.82	1 (5%)
6	SO4	C	510	4,5	4,4,4	0.26	0	6,6,6	0.34	0
9	EDO	D	505	-	3,3,3	0.52	0	2,2,2	0.21	0
9	EDO	A	516	-	3,3,3	0.55	0	2,2,2	0.32	0
9	EDO	B	518	-	3,3,3	0.53	0	2,2,2	0.23	0
9	EDO	B	516	-	3,3,3	0.45	0	2,2,2	0.47	0
6	SO4	D	503	-	4,4,4	0.27	0	6,6,6	0.21	0
7	NAG	D	511	1	14,14,15	1.07	2 (14%)	17,19,21	0.86	1 (5%)
8	ELH	A	515	4,5	19,20,20	6.51	8 (42%)	27,28,28	4.17	7 (25%)
6	SO4	C	511	10	4,4,4	0.27	0	6,6,6	0.29	0
11	IPA	B	515	-	3,3,3	0.44	0	3,3,3	0.32	0
6	SO4	A	503	-	4,4,4	0.30	0	6,6,6	0.37	0
7	NAG	C	509	1	14,14,15	0.48	0	17,19,21	0.55	0
9	EDO	D	514	-	3,3,3	0.50	0	2,2,2	0.21	0
6	SO4	B	505	-	4,4,4	0.29	0	6,6,6	0.13	0
7	NAG	A	505	1	14,14,15	0.40	0	17,19,21	0.67	0
8	ELH	B	512	4,5	19,20,20	3.76	4 (21%)	27,28,28	3.83	15 (55%)
6	SO4	B	511	-	4,4,4	0.31	0	6,6,6	0.22	0
7	NAG	D	504	1	14,14,15	0.41	0	17,19,21	0.44	0
12	GOL	C	513	-	5,5,5	1.30	1 (20%)	5,5,5	1.14	1 (20%)
9	EDO	B	517	-	3,3,3	0.44	0	2,2,2	0.44	0
6	SO4	D	512	4,5	4,4,4	0.24	0	6,6,6	0.18	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	B	507	1	-	4/6/23/26	0/1/1/1
7	NAG	C	505	1	-	0/6/23/26	0/1/1/1
7	NAG	C	509	1	-	0/6/23/26	0/1/1/1
7	NAG	B	506	1	-	1/6/23/26	0/1/1/1
9	EDO	C	512	-	-	0/1/1/1	-
9	EDO	D	514	-	-	1/1/1/1	-
7	NAG	A	505	1	-	2/6/23/26	0/1/1/1
7	NAG	D	511	1	-	0/6/23/26	0/1/1/1
8	ELH	B	512	4,5	-	3/8/8/8	0/3/3/3
8	ELH	A	515	4,5	-	2/8/8/8	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	EDO	A	516	-	-	0/1/1/1	-
9	EDO	D	505	-	-	0/1/1/1	-
9	EDO	B	518	-	-	0/1/1/1	-
7	NAG	D	504	1	-	2/6/23/26	0/1/1/1
12	GOL	C	513	-	-	1/4/4/4	-
9	EDO	B	517	-	-	0/1/1/1	-
9	EDO	B	516	-	-	0/1/1/1	-

The worst 5 of 17 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	A	515	ELH	CAN-CAM	-19.79	1.28	1.48
8	A	515	ELH	CAO-SAL	-18.26	1.38	1.73
8	B	512	ELH	CAN-CAM	-14.07	1.34	1.48
8	B	512	ELH	CAO-SAL	-6.52	1.60	1.73
8	A	515	ELH	CAJ-SAL	-5.37	1.58	1.71

The worst 5 of 26 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	515	ELH	CAJ-SAL-CAO	18.38	101.30	89.51
8	B	512	ELH	CAJ-SAL-CAO	13.79	98.35	89.51
8	B	512	ELH	SAL-CAO-NAK	-7.25	107.06	114.22
8	B	512	ELH	OAA-CAM-CAN	6.59	123.97	113.40
8	A	515	ELH	SAL-CAO-NAK	-4.66	109.61	114.22

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	507	NAG	O5-C5-C6-O6
7	B	507	NAG	C4-C5-C6-O6
7	B	507	NAG	C8-C7-N2-C2
7	B	507	NAG	O7-C7-N2-C2
9	D	514	EDO	O1-C1-C2-O2

There are no ring outliers.

8 monomers are involved in 13 short contacts:

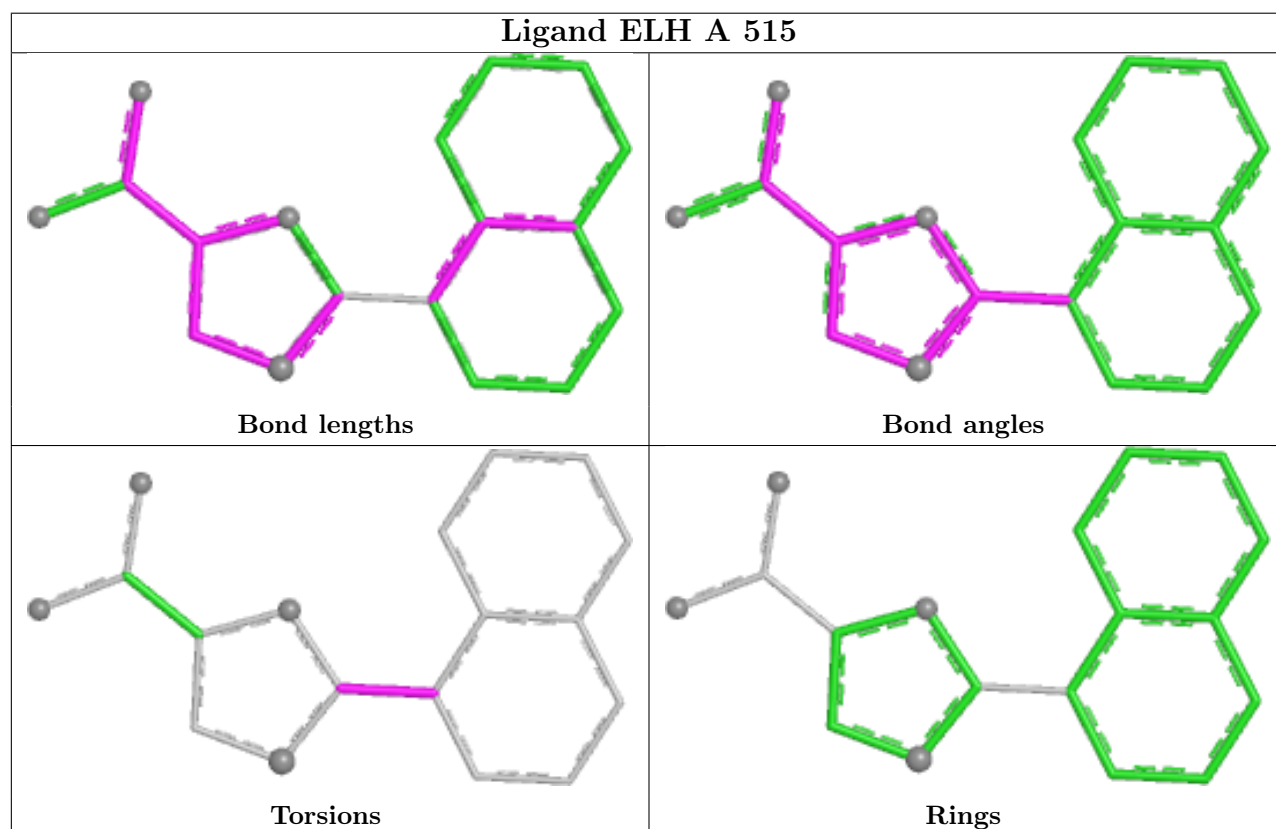
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	B	507	NAG	1	0

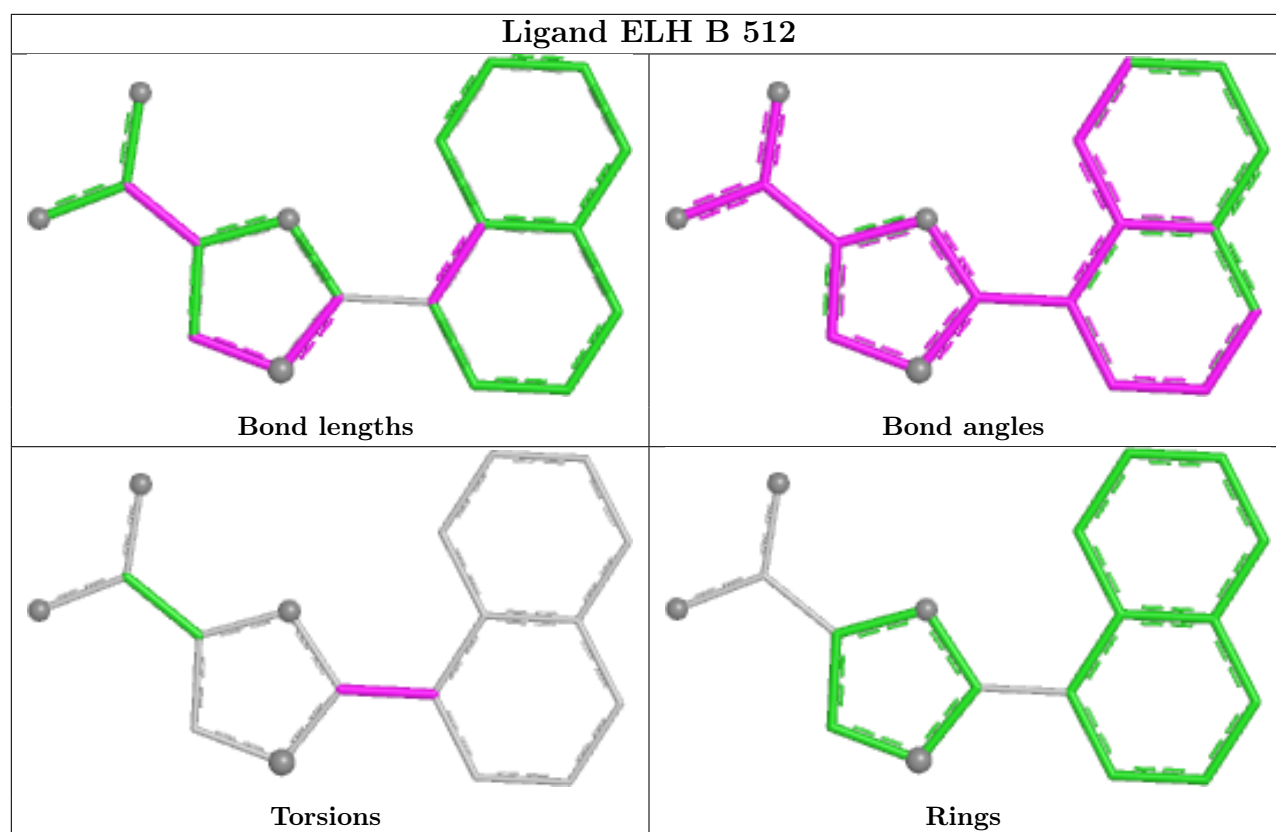
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	C	512	EDO	1	0
8	A	515	ELH	4	0
6	C	511	SO4	1	0
9	D	514	EDO	2	0
8	B	512	ELH	3	0
9	B	517	EDO	1	0
6	D	512	SO4	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	424/426 (99%)	-1.77	0 100 100	16, 30, 41, 61	1 (0%)
1	B	425/426 (99%)	-1.74	0 100 100	16, 32, 44, 72	3 (0%)
1	C	424/426 (99%)	-1.73	0 100 100	23, 32, 45, 81	0
1	D	423/426 (99%)	-1.76	0 100 100	20, 31, 44, 72	1 (0%)
All	All	1696/1704 (99%)	-1.75	0 100 100	16, 31, 44, 81	5 (0%)

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	FUC	E	2	10/11	0.97	0.05	55,62,69,75	0
2	NAG	F	3	14/15	0.97	0.06	65,73,77,77	0
3	FUC	H	2	10/11	0.97	0.05	61,67,69,74	0
3	NAG	H	1	14/15	0.98	0.04	41,56,64,67	0
2	NAG	E	3	14/15	0.98	0.04	40,59,63,64	0
3	FUC	K	2	10/11	0.98	0.05	57,67,70,74	0
2	FUC	G	2	10/11	0.99	0.02	35,38,45,47	0
2	NAG	G	3	14/15	0.99	0.03	28,37,42,42	0
2	NAG	I	1	14/15	0.99	0.02	25,35,41,42	0

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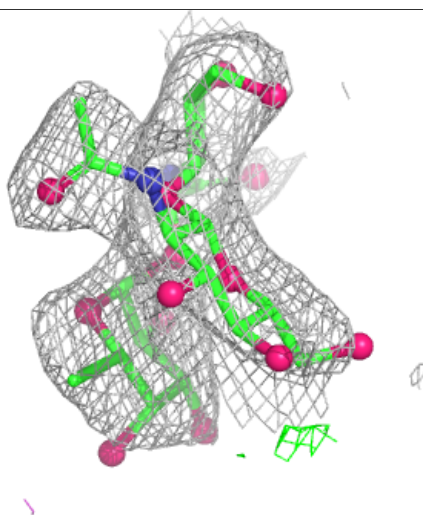
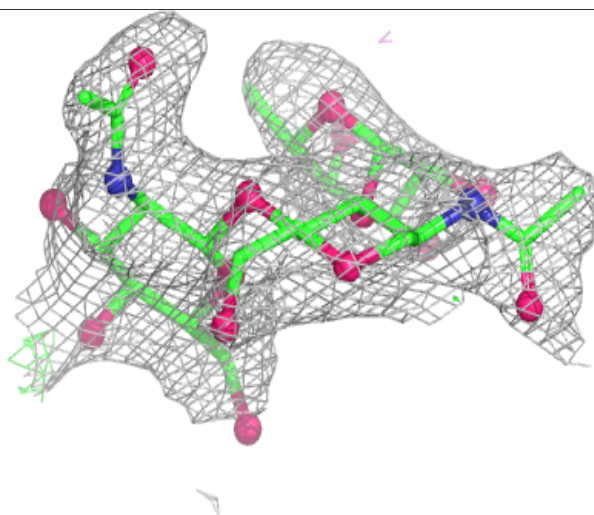
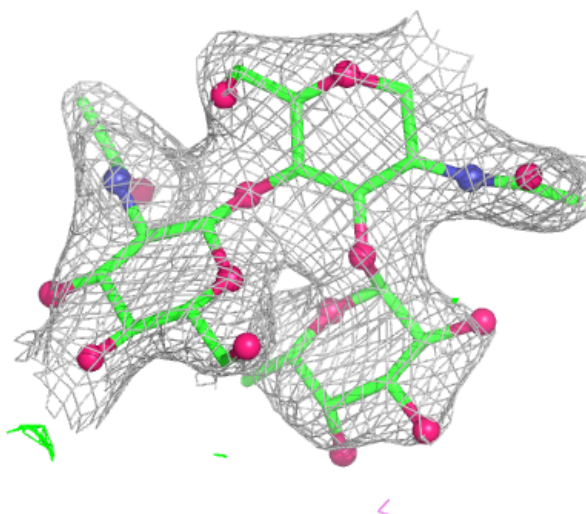
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	I	3	14/15	0.99	0.04	35,41,48,51	0
2	FUC	J	2	10/11	0.99	0.03	44,54,58,59	0
2	NAG	J	3	14/15	0.99	0.04	36,55,63,68	0
2	NAG	M	1	14/15	0.99	0.02	35,40,46,53	0
2	FUC	M	2	10/11	0.99	0.04	53,55,62,62	0
2	NAG	M	3	14/15	0.99	0.04	36,47,62,62	0
2	NAG	F	1	14/15	0.99	0.03	36,54,68,75	0
2	FUC	F	2	10/11	0.99	0.04	65,73,73,74	0
3	NAG	K	1	14/15	0.99	0.04	47,51,59,60	0
2	NAG	E	1	14/15	0.99	0.03	37,49,55,58	0
3	NAG	L	1	14/15	0.99	0.04	35,52,61,61	0
3	FUC	L	2	10/11	0.99	0.03	55,59,62,64	0
2	NAG	J	1	14/15	1.00	0.02	37,41,46,53	0
2	FUC	I	2	10/11	1.00	0.02	37,39,49,57	0
2	NAG	G	1	14/15	1.00	0.02	30,36,43,43	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

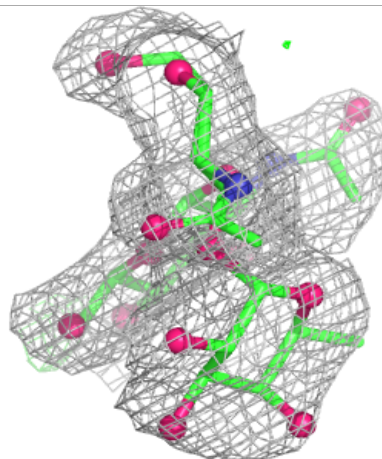
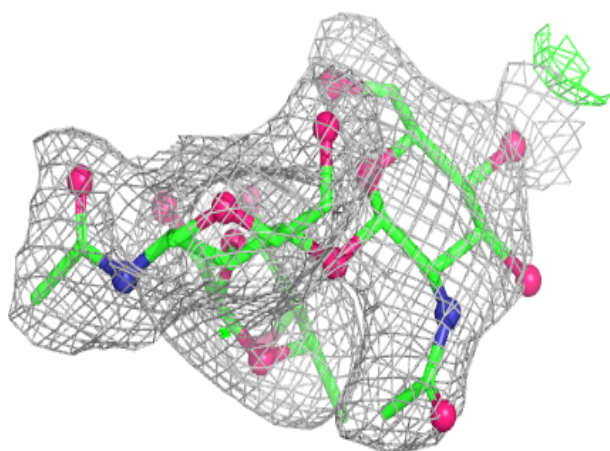
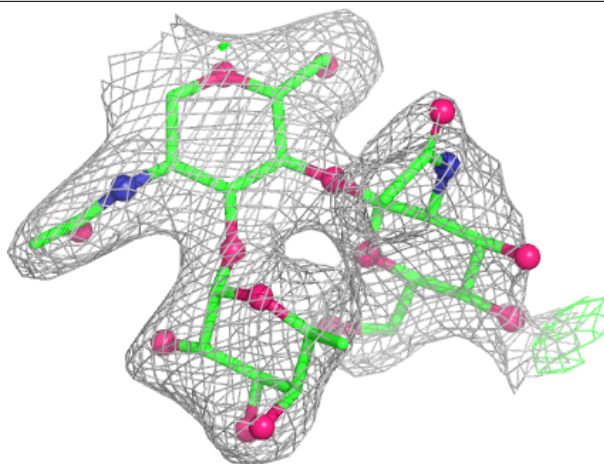
Electron density around Chain E:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



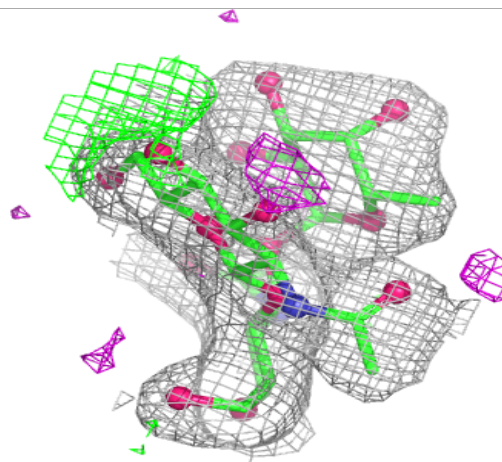
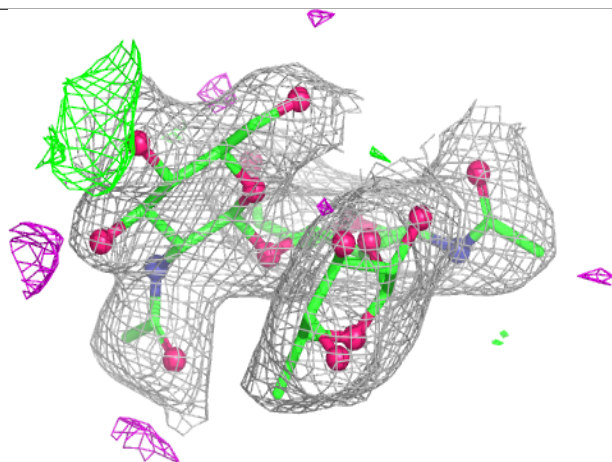
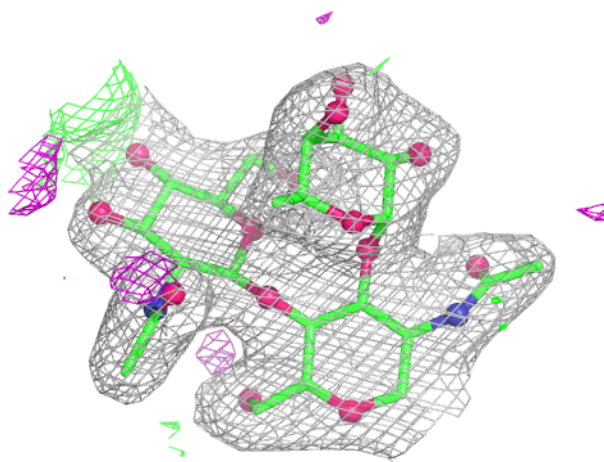
Electron density around Chain F:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



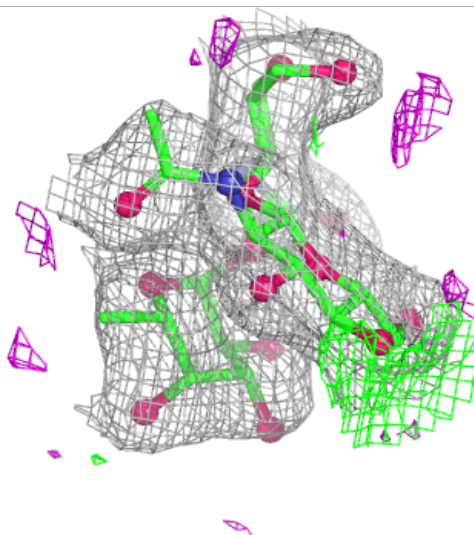
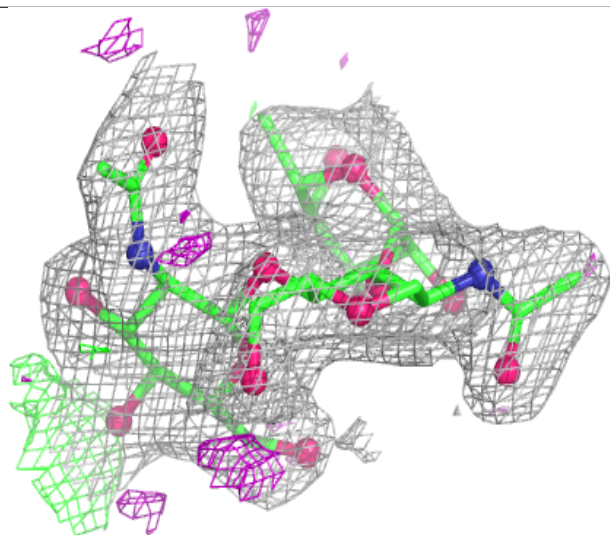
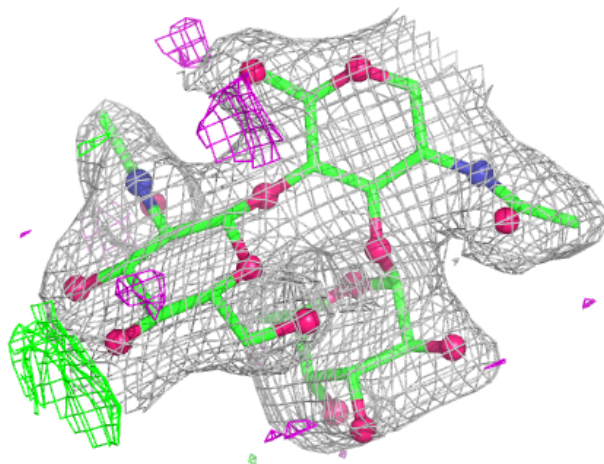
Electron density around Chain G:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



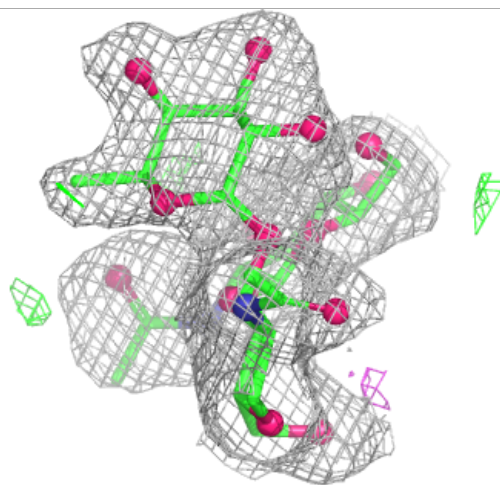
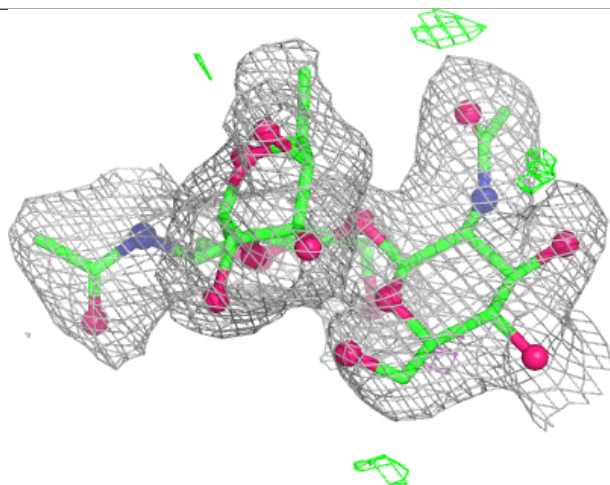
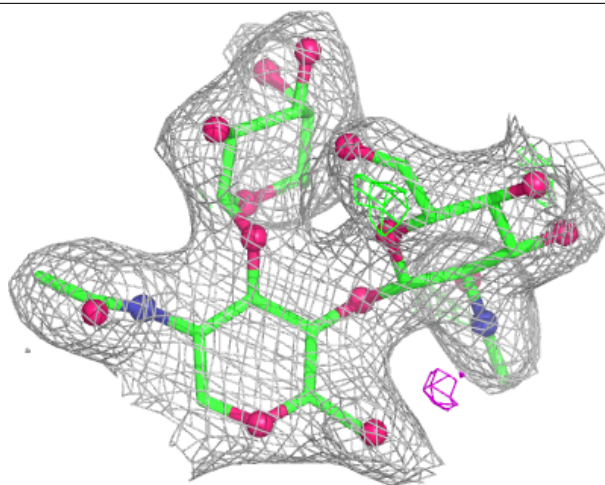
Electron density around Chain I:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



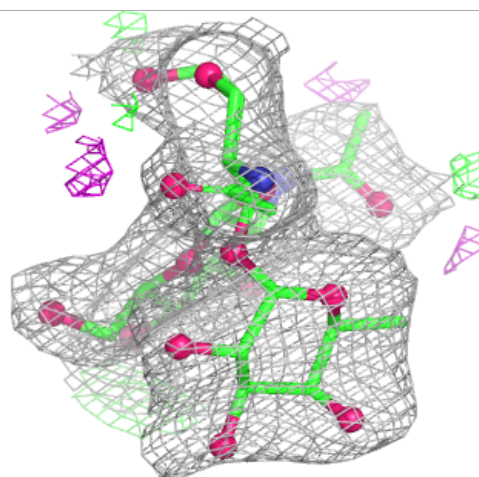
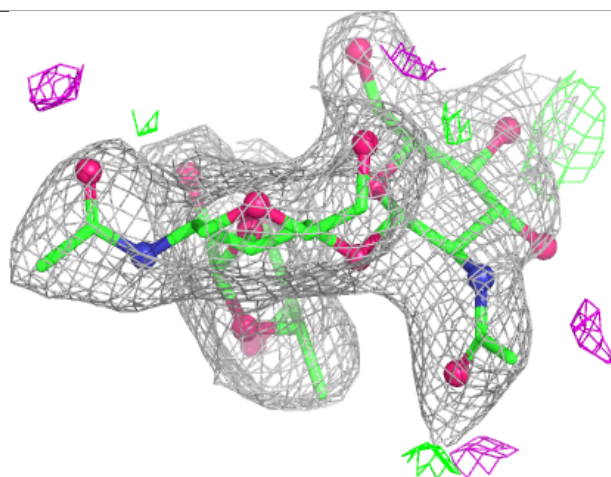
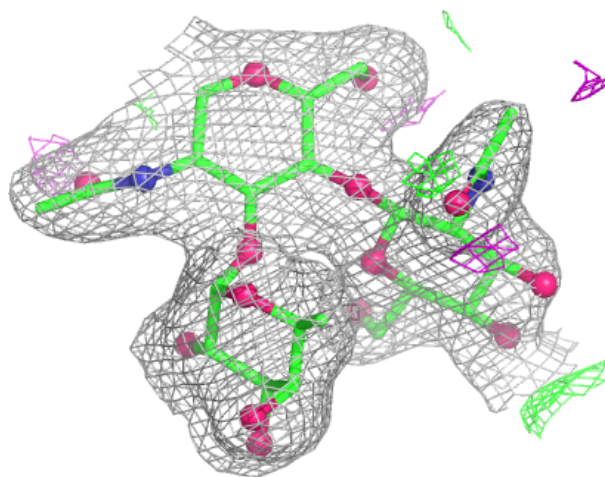
Electron density around Chain J:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



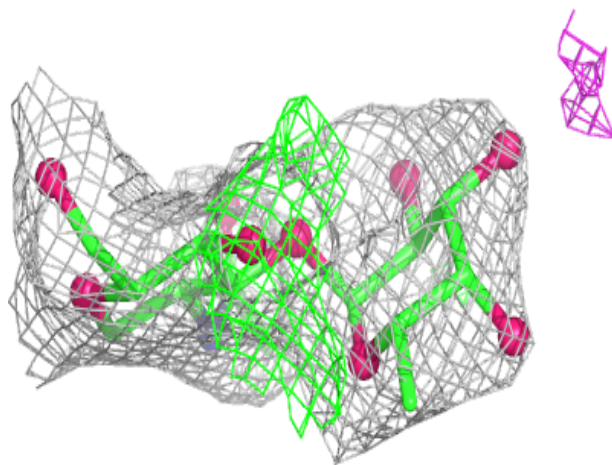
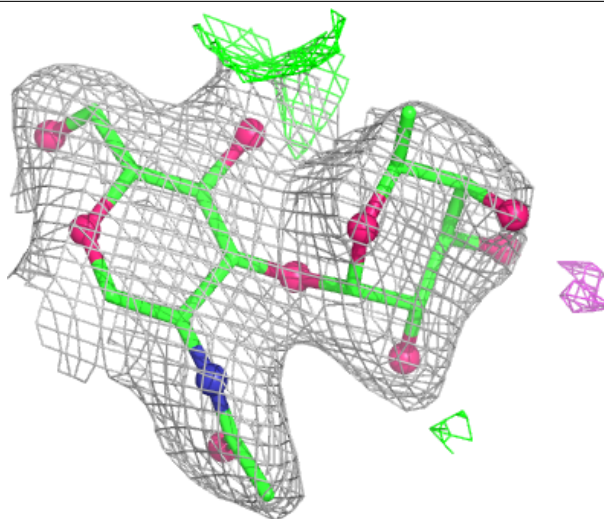
Electron density around Chain M:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



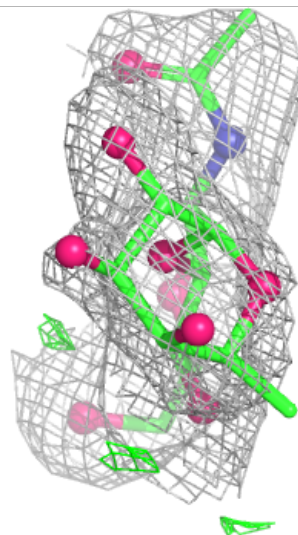
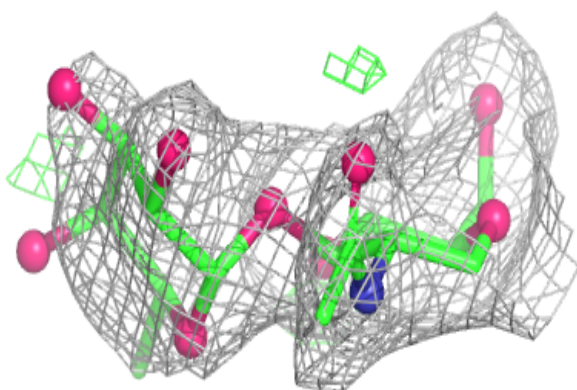
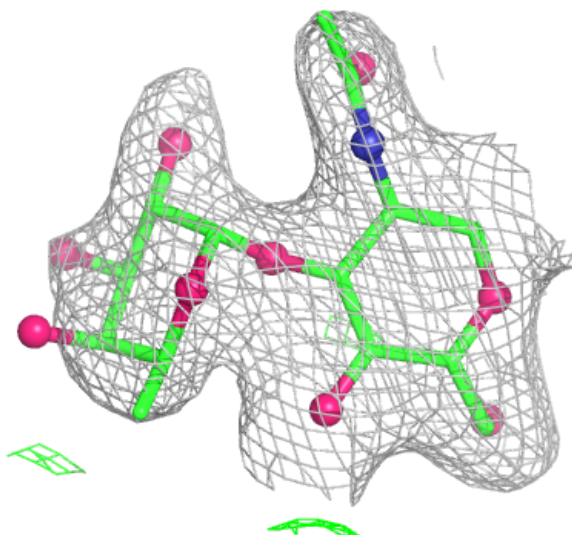
Electron density around Chain H:

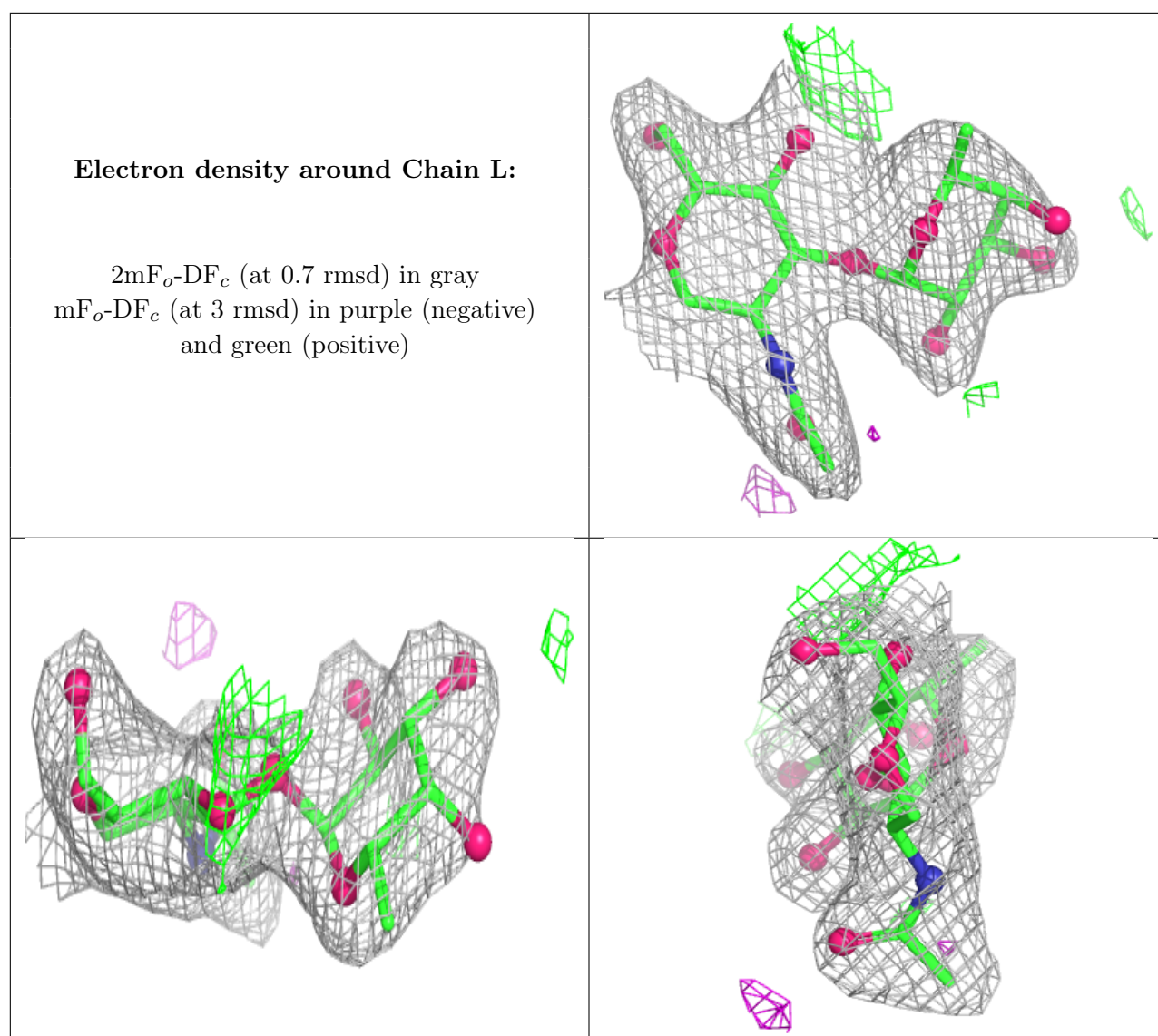
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain K:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
11	IPA	B	515	4/4	0.89	0.13	52,57,64,66	0
9	EDO	A	516	4/4	0.95	0.10	41,44,48,55	0
9	EDO	C	512	4/4	0.96	0.09	51,51,59,60	0
9	EDO	B	516	4/4	0.96	0.11	61,62,64,66	0
6	SO4	A	504	5/5	0.97	0.06	40,42,50,61	5
9	EDO	D	514	4/4	0.97	0.07	45,47,50,54	0
12	GOL	C	513	6/6	0.97	0.09	37,39,49,51	0

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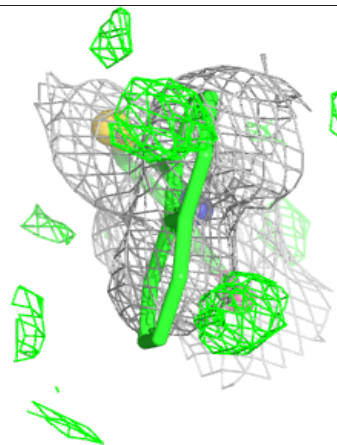
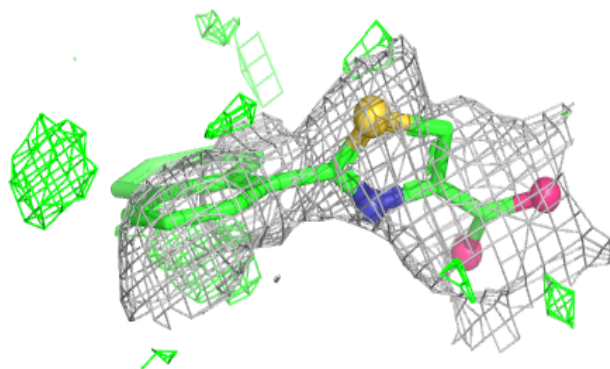
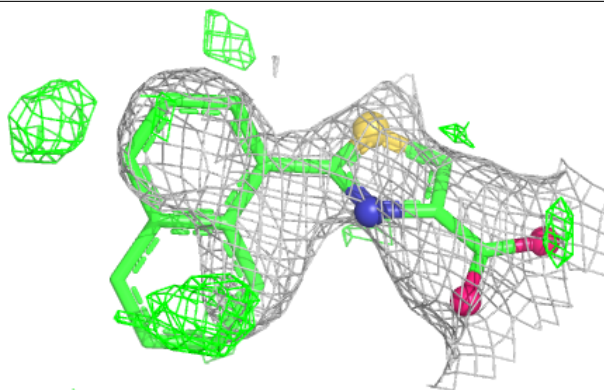
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	SO4	B	505	5/5	0.98	0.05	42,49,60,83	3
7	NAG	D	511	14/15	0.98	0.05	29,48,56,68	0
7	NAG	C	505	14/15	0.99	0.03	38,46,55,56	0
7	NAG	C	509	14/15	0.99	0.02	27,40,46,46	0
8	ELH	A	515	18/18	0.99	0.05	27,57,70,71	18
8	ELH	B	512	18/18	0.99	0.06	31,55,67,69	18
6	SO4	D	503	5/5	0.99	0.04	39,42,52,57	5
7	NAG	A	505	14/15	0.99	0.03	32,34,40,46	0
9	EDO	B	517	4/4	0.99	0.06	40,49,50,50	0
9	EDO	B	518	4/4	0.99	0.06	42,42,47,50	0
9	EDO	D	505	4/4	0.99	0.04	38,41,47,47	0
7	NAG	B	506	14/15	0.99	0.04	37,46,49,51	0
7	NAG	B	507	14/15	0.99	0.04	33,40,48,48	0
10	NA	B	513	1/1	0.99	0.09	32,32,32,32	0
7	NAG	D	504	14/15	0.99	0.03	31,37,44,47	0
6	SO4	B	511	5/5	0.99	0.04	50,82,95,100	0
4	ZN	D	501	1/1	1.00	0.01	32,32,32,32	0
4	ZN	C	501	1/1	1.00	0.00	35,35,35,35	0
6	SO4	D	512	5/5	1.00	0.04	28,33,39,40	5
6	SO4	C	510	5/5	1.00	0.03	28,29,35,38	5
6	SO4	C	511	5/5	1.00	0.06	10,28,30,30	5
5	FE	A	502	1/1	1.00	0.01	32,32,32,32	1
5	FE	B	502	1/1	1.00	0.01	30,30,30,30	1
5	FE	D	502	1/1	1.00	0.01	32,32,32,32	1
5	FE	C	502	1/1	1.00	0.01	33,33,33,33	1
6	SO4	A	503	5/5	1.00	0.02	43,44,48,51	5
10	NA	B	514	1/1	1.00	0.04	16,16,16,16	0
10	NA	D	513	1/1	1.00	0.05	19,19,19,19	0
4	ZN	A	501	1/1	1.00	0.01	34,34,34,34	0
4	ZN	B	501	1/1	1.00	0.01	36,36,36,36	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

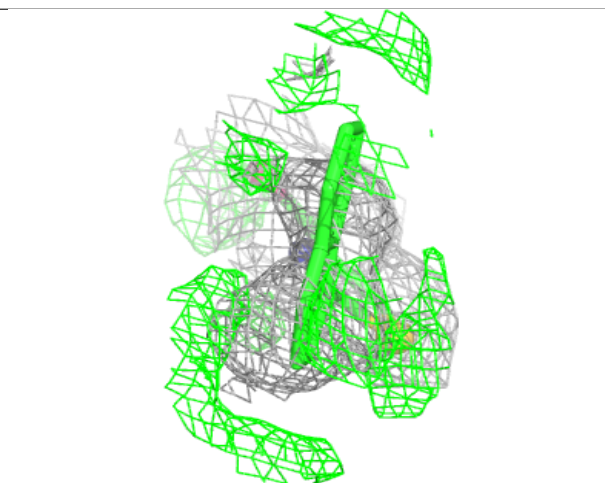
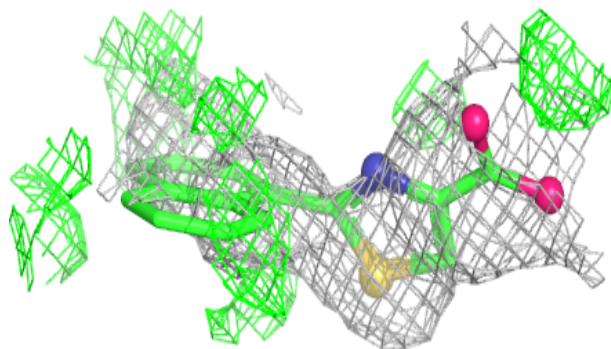
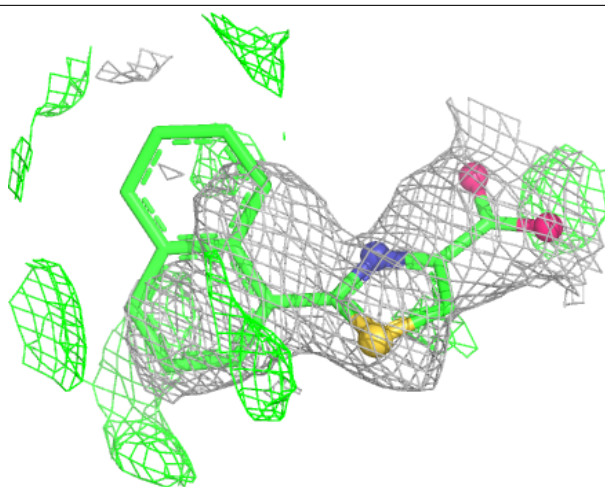
Electron density around ELH A 515:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around ELH B 512:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers ⓘ

There are no such residues in this entry.